REMARKS/ARGUMENTS

Claims 1 and 43 have been amended to delete the recited density range. Claim 48 has been amended as suggested by the Examiner. No new matter has been added.

The Office Action mailed June 17, 2004, has been received and reviewed. Claims 1-13 and 43-48 are currently pending in the application. Claims 1-13 and 43-48 stand rejected. Applicants have amended claims 1, 43, and 48 and respectfully request reconsideration of the application as amended herein.

Formal Drawings

Applicants submit herewith Formal Drawings of Figures 1 and 2. These attached drawings replace the previous drawings.

Declaration Under 37 C.F.R. § 1.132

Applicants submit herewith a Declaration under 37 C.F.R. § 1.132 provided by Andrew J. Sanderson, one of the inventors of the above-referenced application. The Declaration addresses the obviousness rejection of claims 1-13 and 43-48 and includes energetic performance data for the oxetane-oxirane thermoplastic elastomers of the present invention and oxetane-oxetane thermoplastic elastomers.

35 U.S.C. § 112 Claim Rejections

Claims 1-13 and 43-48 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement. Applicants have amended claims 1 and 43 to delete the range of density values. Therefore, Applicants respectfully request that the rejection be withdrawn.

Claim 48 stands rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Applicants have amended claim 48 as suggested by the Examiner and, therefore, respectfully request that the rejection be withdrawn.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on U.S. Patent No. 4,806,613 to Wardle in View of U.S. Patent No. 4,976,794 to Biddle *et al.* and U.S. Patent No. 5,747,603 to Hinshaw *et al.*

Claims 1-13 and 43-48 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,806,613 to Wardle ("Wardle") in view of U.S. Patent No. 4,976,794 to Biddle *et al.* ("Biddle") and U.S. Patent No. 5,747,603 to Hinshaw *et al.* ("Hinshaw"). Applicants respectfully traverse this rejection, as hereinafter set forth.

M.P.E.P. 706.02(j) sets forth the standard for an obviousness rejection:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

In addition, "[o]bjective evidence or secondary considerations such as unexpected results . . . are relevant to the issue of obviousness and must be considered." M.P.E.P. § 2141. To rebut a *prima facie* case of obviousness, an applicant "may submit additional evidence of nonobviousness, such as comparative test data showing the claimed invention possesses improved properties not expected by the prior art." M.P.E.P. § 2142. In other words, the "[r]ebuttal evidence may . . . include evidence that the claimed invention yields unexpectedly improved properties or properties not present in the prior art." M.P.E.P. § 2144.08. The unexpected results or improved properties must be "greater than those which would have been expected from the prior art to an unobvious extent" and must be "of a significant, practical advantage." M.P.E.P. § 716.02(a)I.

Applicants respectfully submit that the obviousness rejection of claims 1-13 and 43-48 is improper because the thermoplastic elastomers of the claimed invention have an unexpectedly improved energetic performance compared to thermoplastic elastomers that include oxetane and oxetane monomers.

As amended, independent claim 1 recites an energetic thermoplastic elastomer that comprises A blocks, B blocks, and linking groups. The A blocks are terminated with isocyanate-reactive groups derived from monomers comprising one or more oxetane derivatives. The A blocks are crystalline below about 60°C. The B blocks are terminated with isocyanate-reactive groups derived from monomers comprising at least one member selected from the group consisting of oxirane and derivatives thereof. The B blocks are amorphous above about -20°C. The linking groups are derived from at least one diisocyanate and at least one linking compound comprising two functional groups which are reactive with isocyanate moieties of the at least one diisocyanate.

Wardle teaches a method of producing a thermoplastic elastomer having A blocks and at least one B block. Wardle at column 3, lines 64-67. The thermoplastic elastomer is used as a binder in a high energy composition. Wardle at column 6, lines 38-46. The A blocks are crystalline at a temperature below 60°C and are polyethers derived from monomers of oxetane and its derivatives and/or tetrahydrofuran and its derivatives. Wardle at column 3, line 67 through column 4, line 6. The B blocks are amorphous at a temperature above -20°C and are polyethers derived from monomers of oxetane and its derivatives and/or tetrahydrofuran and its derivatives. *Id.* Examples of oxetanes include 3,3-bis(ethoxymethyl)oxetane ("BEMO"), 3,3-bis(chloromethyl)oxetane ("BCMO"), 3,3-bis(methoxymethyl)oxetane ("BMMO"), 3,3-bis(fluoromethyl)oxetane ("BFMO"), 3-hydroxymethyl-3-methyloxetane ("HMMO"), 3,3-bis(acetoxymethyl)oxetane ("BAOMO"), 3,3-bis(hydroxymethyl)oxetane ("BHMO"), 3-octoxymethyl-3-methyloxetane ("OMMO"), 3,3-bis(methoxyethoxymethyl)oxetane ("BMEMO"), 3-chloromethyl-3-methyloxetane ("CMMO"), 3-azidomethyl-3-methyloxetane ("AMMO"), 3-3-bis(iodomethyl)oxetane ("BIMO"), 3-iodomethyl-3-methyloxetane ("IMMO"), 3-propynomethylmethyloxetane ("PMMO"), 3,3-bis(nitratomethyl)oxetane ("BNMO"), 3-nitratomethyl-3-methyloxetane ("NMMO"), 3,3-bis(methylnitraminomethyl)oxetane ("BMNAMO"), 3-methylnitraminomethyl-3-methyloxetane ("MNAMMO"), and 3,3-bis(azidomethyl)oxetane ("BAMO"). Wardle at column 4, lines 19-61. The thermoplastic elastomer is prepared by separately forming the A blocks and the B blocks, which are then separately end-capped with a diisocyanate. Wardle at column 7, lines 38-44. The end-capped A blocks and B blocks are then joined by a linking compound. Wardle at column 7, lines 48-53.

Biddle teaches a low vulnerability ammunition ("LOVA") gun propellant that includes oxidizer particles and a thermoplastic elastomer. Biddle at column 2, lines 25-28. The thermoplastic elastomer includes at least one block that is amorphous at room temperature and at least one block that is crystalline at room temperature. *Id.* at column 2, lines 29-33. The amorphous blocks include glycidyl azide polymer ("GAP") or poly(glycidyl nitrate) ("PGN"). Column 6, lines 25-34.

Hinshaw teaches a hydroxyl-terminated polymer in which the terminal hydroxyl groups are non-primary or are hindered. The terminal hydroxyl groups are end-capped to provide the polymer with terminal, primary, non-hindered hydroxyl groups. The end-capped polymer is then cured with an isocyanate.

As acknowledged by the Examiner, Wardle does not "disclose the specific use of oxirane-based soft segment." Office Action of June 17, 2004, at p. 3. Therefore, the Examiner relies on Biddle and Hinshaw as teaching this limitation. *Id.* The Examiner states that the motivation to combine the cited references is "that it would have been obvious to utilize an oxirane-based segment as the soft segment of Wardle, because it has been held that it is *prima facie* obvious to utilize a known ingredient for its known function." *Id.*, at p. 4.

However, as attested to in the accompanying Declaration, the thermoplastic elastomers of the present invention as claimed (the thermoplastic elastomers formed from oxetane and oxirane monomers) have improved energetic performance compared to thermoplastic elastomers formed from oxetane and oxetane monomers, such as those taught by Wardle. As shown in Table 1 of the Declaration, the impetus ("I") of gun propellant compositions that included the thermoplastic elastomers of the present invention as claimed was significantly higher than the impetus of gun propellant compositions that included oxetane-oxetane thermoplastic elastomers. In addition, as shown in Table 2 of the Declaration, the burning rates of the thermoplastic elastomers of the present invention as claimed were significantly higher than those of the oxetane-oxetane thermoplastic elastomers. The densities, detonation pressures, detonation velocities, and detonation energies of explosive compositions that included the thermoplastic elastomers of the present invention as claimed were also significantly higher than those of explosive compositions that included oxetane-oxetane thermoplastic elastomers, as shown in Table 3.

The improved energetic performance is unexpected because the cited references do not provide any teaching or suggestion that thermoplastic elastomers formed from oxetane and oxirane monomers, such as those of the present invention, would have improved energetic properties over thermoplastic elastomers formed from oxetane and oxetane monomers. While Wardle teaches using oxetane monomers and Biddle teaches oxirane monomers, nothing in Wardle, Biddle, or Hinshaw provides any expectation for the increased energetic performance when oxetane and oxirane monomers are used in thermoplastic elastomers. As such, the increased energetic performance of the thermoplastic elastomers of the present invention is nonobvious. In addition, the improved energetic performance of the thermoplastic elastomers of the present invention provides significant, practical advantages when these thermoplastic elastomers are used in gun propellant compositions or other explosive compositions.

ENTRY OF AMENDMENTS

The amendments to claims 1, 43, and 48 above should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add new matter to the application.

CONCLUSION

Claims 1-13 and 43-48 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicants' undersigned attorney.

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Attachments: Declaration Under 37 C.F.R. § 1.132 w/Appendix (8 total pages)
Formal Drawings (2 sheets, 2 figures)

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